ON-ORBIT CHARACTERIZATION (4/14/94)

OBJECTIVE: Assessment of MODIS performance

- Pre-launch and on-orbit using the TLCF
- During operational calibration in the PGS
- Algorithms provided by the MCST
- Algorithms developed by SBRC for pre-launch analysis will be applied to post-launch characterization

MODIS Science Computing Facility (SCF)
Product Generation System (PGS)
MODIS Characterization Support Team (MCST).

ON-ORBIT CHARACTERIZATION (VERIFICATION OF SPECIFICATION)

Specification Requirement	Paragraph of Spec	How verified
Lifetime	3.2.3	Check responsivity, S/N, etc. for duration of mission
Instantaneous-Field-of-View	3.3.1	SRCA data will be monitored to measure the along-scan IFOV
Radiometric Sensitivity	3.3.4	Monitor the noise and responsivity performance of the channels using the internal calibration sources
Spectral	3.4.7.4	Assess SRCA for spectral characteristics.
Dynamic Range	3.4.1	Monitor this parameter using internal calibration sources.
Modulation-Transfer-Function	3.4.2	Along-scan MTF will be assessed using SRCA data.

ON-ORBIT CHARACTERIZATION (VERIFICATION OF SPECIFICATION)

Specification Requirement	Paragraph of Spec	How verified
Transient Response	3.3.4	(Bright Target Recovery) and Memory Effects - This will be assessed by looking at MODIS response to the SD for reflective bands and to the SV for thermal bands. Sufficient observation across the Moon could also be used.
Channel to Channel Uniformity	3.4.5.3.2	Will be validated by comparison of histograms of different channels in the same spectral bands.
Pattern Noise	3.4.5.3.3	Assess the pattern noise (Coherent noise) by analyzing FFTS when viewing flat scenes.
Spectral Band Registration	3.4.6.3	Channel-to-Channel coregistration will be checked using SRCA data and scan data from selected "window" channels which see the earth by comparing landmarks or cloud edges in different spectral bands.

ON-ORBIT PERFORMANCE OF OTHER KEY PARAMETERS

Parameter	What to look for/How measured
Noise	Look for changes in the noise behavior as a function of MODIS redundancy configuration, scan position, instrument temperatures, orbit position, spacecraft activities, and activities of other sensors on the EOS spacecraft. Take data from the solar reflective channels at night. Use BB and space view (SV) data for solar reflected and IR channels. Look for the noise spectrum of the channels.
Gain	Assess changes in the gain as a function of MODIS redundancy configuration, scan position, instrument temperatures, orbit position, spacecraft activities, and activities of other sensors on the EOS spacecraft. Use SRCA, SD, BB, SV measurements.

ON-ORBIT PERFORMANCE OF OTHER KEY PARAMETERS

Parameter	What to look for/How measured
Space Reference and Offset	Assess changes in both the space reference and the offset levels when looking at space for each channel as a function of MODIS redundancy configuration, instrument temperatures, orbit position, spacecraft activities, and activities of other sensors on the EOS spacecraft. Information is available for all of the Photo Voltaic channels to establish the offset. Similar information is planned to be available for the Photo Conductive channels. Comparison with the prelaunch behavior as a function of instrument configuration and temperature may provide an early indication of detector changes.
Baseline Drift	Track changes in the Space View signal counts from scan to scan when there is no change in the offset level to provide a measure of the baseline drift. Baseline drift increases NEΔL, NEΔT and the striping in the data.
A/D Converter Uniformity	Compare along-scan histograms of uncalibrated level 1 data to assess the performance of the A/D converters using "raw" instrument data.

TRENDING OF PERFORMANCE DATA

- **Data will be trended to provide:**

  an overview of MODIS performance

  an early warning of potential problems

- **Trend data will start with acceptance testing at SBRC, data from MMAC and continue throughout the on-orbit life**

- **All key parameters will be trended**
  -e.g., noise, gain, space value, offset for each channel

- **Trend data as a function of orbit position, telemetry data, other instrument and spacecraft activity**

- **Help identify causes of anomalous behavior in the MODIS.**

- **Trend data in graphical and tabular form using commercial software such as PV Wave.**

Risk Assessment

- Essential to characterize MODIS in orbit

  -Quality of science data would be suspect

- Loss of SRCA challenges most of verification

- SRCA is partial aperture

- Future cost cutting activities place the SRCA at risk. Elimination of SRCA would devastate calibration of MODIS